

# LED DEVICE AND THE MANUFACTURING METHOD THEREOF

## 5 BACKGROUND OF THE INVENTION

### 1. Field of the invention

This invention relates to a LED device and the manufacturing method  
10 thereof, and particularly to a device that is not easily released and is thus safer.

### 2. Description of the prior art

In conventional LED devices such as the one disclosed in the US Patent  
15 No. 6,200,003B1, the light emitting diode is primarily inserted into the socket,  
which is then inserted into a case, and connected via two conducting plates so  
as to form a lighting structure that is capable of exhibiting lamp changes.  
However, such a structure may exhibit lighting effects only in a single  
construction. But on the other hand, when it is connected in series or in parallel,  
20 it is often subject to factors such as the fastening style of its case and socket  
and the connection of the connecting plates, thus making it inconvenient when  
it is connected in series. Moreover, it cannot achieve a perfect visual  
appearance and can easily be released.

25 In order to overcome the shortcomings inherent in the conventional LED

devices described above, the present inventor has delved into this matter with long-time efforts and has come to the realization of the present invention.

## 5 SUMMARY OF THE INVENTION

Hence, it is an object of the present invention to provide a LED device and the manufacturing method thereof, and the overall safety can be enhanced through structures such as a LED, a LED chip, bonded wires, lead frames and  
10 an enveloped lamp cap.

The LED device and the manufacturing method thereof according to the present invention is an invention wherein the LED device diverges from its two sides via the insulating lead wires so as to make it even more compact when it is enveloped with the protective device. Moreover, it is easier to make the lead  
15 wires be connected in series and in parallel and to form any shapes and models.

The LED device and the manufacturing method thereof according to the present invention is an invention that can make manufacturing convenient.

A more complete understanding of these and other features and advantages of the patent invention will become apparent from a careful  
20 consideration of the following detailed description of certain embodiments illustrated in the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A and Fig. 1B are the first cross-sectional perspective views of the present invention.

5 Fig. 2 is the second cross-sectional perspective view of the present invention.

Fig. 3A and Fig. 3B are solid perspective views showing the decomposition of the present invention.

Fig. 4 is a perspective view showing the first embodiment of the present invention.

10 Fig. 5 illustrates the second embodiment of the present invention.

Fig. 6 is a perspective view showing the third embodiment of the present invention.

Fig. 7A ~ Fig. 7D is the first flowchart showing the first embodiment of the manufacturing of the present invention.

15 Fig. 8A~ Fig. 8F is the second flowchart showing the second embodiment of the manufacturing of the present invention.

Fig. 9 is the third flowchart showing the third embodiment of the manufacturing of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Fig. 1A, the LED device 1 in the present invention is composed of a LED light bulb, insulating lead wires and protective devices; two lead frames 21, 22 are installed on the LED light bulb, and the lower end of the two lead frames 21, 22 form an electrical connecting portion respectively, wherein a LED chip 3 installed on the top of one of the lead frame 21 and the LED chip 3 is then connected to another lead frame 22 via bonded wires 31, and a lamp cap 4 is installed on the exterior so that the electrical connecting portion 20 on the lower end of the two lead frames 21 and 22 emerges from the lamp cap 4.

The insulating end on the top end of the insulating lead wires 11 and 12 is bent to the back and extended sideward so as to form an opening 13 in such a way that the conductor 14 in the center is connected to the electrical connecting portion 20 on the lower end of said lead frames 21 and 22.

The protective device 5 envelops the LED light bulb, the electrical connecting portion and the opening 13 formed by the backward bending and the sideward extension of the top of the insulating lead wires so as to achieve a safe device that is not easily released from the insulating lead wires and the electrical connecting portion.

Said lamp cap 4 can be made of plastics or transparent, semi-transparent or added with fluorescent substances; an insulating positioning bracket 41 is installed on the lower end of the lead frames 21 and 22 so as to firmly fix its position; the insulating lead wires connected on the lower end of the LED light bulb can be two or multiple in number, and parallel to one another or be in a predetermined angle (for example, at a right angle or in a straight line at 180°); the connection between the conductor of the lead wire 14 and the lead frames 21 and 22 can be welded or pressure bonded; the protective device 5 can also be transparent, semi-transparent or added with fluorescent substances, and can also envelop the entirety or parts of the LED light bulb.

Referring to Fig. 1B, this is another embodiment of the present invention wherein the insulating lead wires 11A and 12A are connected in straight lines at 180° to the two sides.

Referring to Fig. 2, this is another embodiment of the present invention wherein the protective devices 5A and 5B as shown can be predetermined from different shapes, for example, regular or irregular shapes, flat or convex/concave so as to make the overall LED device be enveloped by plastics.

The LED device of the present invention as shown in Fig. 3A and Fig. 3B can be enveloped by two enveloping plates 51 and 52 on the top and the bottom

like the protective devices as shown in Fig. 1A, 1B, and 2 so as to envelop the light emitting element 6 wherein the enveloping plates 51 and 52 are concave-shaped hollows with their hollow part 50 in the interior, and the two ends of the enveloping plates form an opening 53 respectively so as to install the insulating lead wires. Moreover, the bent part (that is the branching off part) of the insulation of the insulating lead wires tightly locked by the internal border locks and the lock 51 formed in the periphery of the connection are firmly fixed by joining or gluing so as to make them not easily become released. The embodiment of the LED device of the present invention as shown in Fig. 4 can be composed of a plurality of LED light emitting elements 1A, which consists of electrodes and a plurality of electrodes, which are connected by a plurality of insulating lead wires in such a way that the insulating ends on the top of insulating lead wires are bent to the back and extended sideward to form an opening so that the conductor in the center connects to the electrode on the chip base of different LED light emitting elements.

The protective device 5 envelops the entirety or parts of the light emitting elements, different electrical connecting portions and the opening formed by the backward bending and the sideward extension of the top of the insulating lead wires and can be connected in series, parallel or series-parallel in

accordance with the directionality of the LED.

A power supply device is composed of a plug 71 and a socket 70, which connects to the lighting set so as to form predetermined functions, words, figures or shapes.

5        Said light emitting elements can be of the same or different functions and can be of the same or different colors.

A plurality of LED light emitting elements can also be connected in strings as shown in the figure or connected in arrays as shown in Fig. 5. When they are connected in arrays, the LED should be made in different arrangements such as  
10        squares, rhombuses, or triangles and can also form into a network shape or a curtain type, or a two-plate shape.

Moreover, said power supply devices can connect to a function controller  
72 so as to form predetermined functions.

Fig. 6 shows different LED devices are connected in rhombuses, and the  
15        intersecting LED light emitting elements 6A and 6B in their interior connect to the different light emitting elements 6A and 6B via insulating lead wires. Regarding the manufacturing method of the LED device of the present invention, the LED device consists of the LED light bulb, lead frames, insulating lead wires and protective devices, and the steps for their

manufacturing are as follows:

First separate the top of the insulating lead wires 81 and 82 into at least two plates so as to form a branching off part 80 so that the conductor 83 (as shown in Fig. 7A) is exposed; properly make two lead frames 84, 85, and an electrical connecting portion 841 is formed on the lower end so that a LED chip 86 is installed on the top of one of the lead frames 84, and a lamp cap 87 is then installed on the exterior, and the lower end of the lamp cap forms a flange 871 (as shown in Fig. 7B); the emerged conductor 83 and the lead frames 84, 85 are electrically connected to the electrical connecting portion 841 and the lead wires (as shown in Fig. 7C); a protective device 88 envelops the lower end of the lamp cap and the electrical connecting portion and is firmly fixed by lead wires 81 and 82 (as shown in Fig. 7D). The protective device can be made by plastics or enveloped from multiple combinations. For another manufacturing method, the opening at the top of the insulating lead wires 81A and 82A emerges from the conductor 83 (as shown in Fig 8A). Moreover, properly make the LED light emitting element 80A, on which lead frames 84 and 85 are installed, and an insulating positioning bracket is installed on the LED light emitting elements 84A and 85A, wherein a LED chip 86A is installed on one of the lead frames 84A, and connected to another lead frame 85A via bonded



wires (as shown in Fig. 8B); the emerged conductor 83A is electrically connected to the lead frames 84A and 85A (as shown in Fig. 8C), then inserted the insulating positioning bracket 872A as shown in Fig. 8D, and coupled the flange 871A on the lower end of the enveloping plates and the insulating positioning bracket 872A of the lead frame, and finally enveloped and positioned by the protective device 88A (as shown in Fig. 8F.)

For another manufacturing method, as shown in Fig. 9, a LED chip base 91 is installed, and the first electrode 91A and the second electrode 91B are installed on the LED chip base wherein a LED chip 92 is installed on the first electrode 91A. After the LED chip 92 has been installed on the first electrode 91A, then the LED chip 92 is electrically connected to the second electrode 91B via bonded wires. After the overall structure has been assembled, an insulating lead wire 94 and 95 is installed on the first electrode 91A and the second electrode 91B respectively and then the front end of the insulating lead wires 94 and 95 branches off to form an opening 951 so as to expose the conductor 96; then the emerged conductor 96 is electrically connected to the first electrode 91A and the second electrode 91B, and then enveloped by the enveloping plates 97 and 98 in the top and the bottom in the hollow in the interior so as to form an overall structure. It can also be enveloped and fixed by

the protective device of plastic materials.

From the above, the LED device and the manufacturing method of the present invention can definitely be safer and effective when it is used, and such effects can definitely improve the weaknesses inherent in the conventional LEDs. Moreover, the invention has not yet been publicly disclosed and used. Hence, the present invention is deemed to comply with conditions for approvable patents stipulated by Patent Law. We sincerely hope that the present invention can be allowed for registration.

Although the invention has been described in terms of preferred embodiments, it is apparent that numerous variations and modifications may be made without departing from the true spirit and scope thereof, as set forth in the following claims.